

Mason type II radial head fractures fixed with Herbert bone screws

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SUMMARY

The management of radial head fractures remains controversial. Accurate classification of the fracture (Mason) may necessitate the use of special X-ray views (45° anterior oblique or radio-capitellar). We present the results of 19 cases of Mason type II fractures treated operatively by open reduction and internal fixation with the Herbert bone screw. All patients achieved 'good-to-excellent' outcome at follow-up. Our results compare favourably with other forms of treatment for this injury.

INTRODUCTION

Fractures of the head of the radius were first described by Thomas in 1905. It is generally accepted that the cause of injury is a fall on the outstretched hand. Variable soft tissue injury around the elbow sometimes occurs with the more severe fractures. A number of classifications of this fracture have appeared over the years: currently in most common use are those of Mason (modified by Johnston)^{1,2} and the AO classification (Figure 1). As with many orthopaedic conditions, the management of the various types of radial head fracture is controversial.

From a review of the literature we found that Mason type I fractures are treated by most surgeons without operation. However, the treatment of the more severe injuries, types II and III, is one which creates a good deal of debate. Treatment options recommended over the last 90 years include: 'benign neglect'; aggressive internal fixation (using a wide variety of hardware); and excision with or without prosthetic replacement³⁻¹³. More recently, the use of fibrin adhesives has been recommended¹⁴. After reading this literature I still was unsure of appropriate treatment for the more displaced fractures.

It has been the policy of the senior author (MP) to carry out open reduction and internal fixation of Mason type II fractures with a Herbert screw followed by early mobilization. We wish to report on that experience in 19 Mason Type II fractures managed in this way.

MATERIALS AND METHOD

Nineteen patients (11 females and 8 males) with Mason type II radial head fractures aged between 15 and 65 (average 39

years) underwent open reduction and internal fixation with the Herbert differential pitch bone screw¹⁵. There were no Essex-Lopresti type injuries in this group¹⁶. However, one patient sustained an associated undisplaced ipsilateral distal radial fracture. The remaining 18 fractured radial heads occurred in isolation.

Fractures were graded preoperatively using standard antero-posterior (AP) and lateral X-rays. Additional views were taken in many of these cases, namely the 45° anterior oblique¹ and Greenspan and Norman's radio-capitellar views¹⁷ (Figure 2a,b,c,d). All 19 patients underwent surgery within 1 week of injury.

All operations were performed through a lateral (modified Kocher) approach, preserving soft tissue attachments of fragments and the lateral collateral ligament, where possible. The annular ligament was preserved; occasionally being partially divided to allow access, but subsequently repaired. Any associated damage to the capitellum was noted before internal fixation. After reduction, the fragments were sometimes held reduced by temporary K wires. Definitive fixation was effected by one or two Herbert screws. Only occasionally was the scaphoid jig employed. Most elbows were screened on the table by an image intensifier to confirm reduction and containment of screws.

No casts were applied, the arm being supported in a standard triangular sling until postoperative pain had settled and early movement could begin. Mobilization was supervised by a physiotherapist, initially employing passive/assisted exercises. As pain decreased this progressed to active movement.

Follow-up assessment was carried out 0.5 to 5 years after injury (average 2.3 years). All patients were assessed by one author (MP). The assessment system used was that recommended by Morrey⁵ (Table 1). This scores four key

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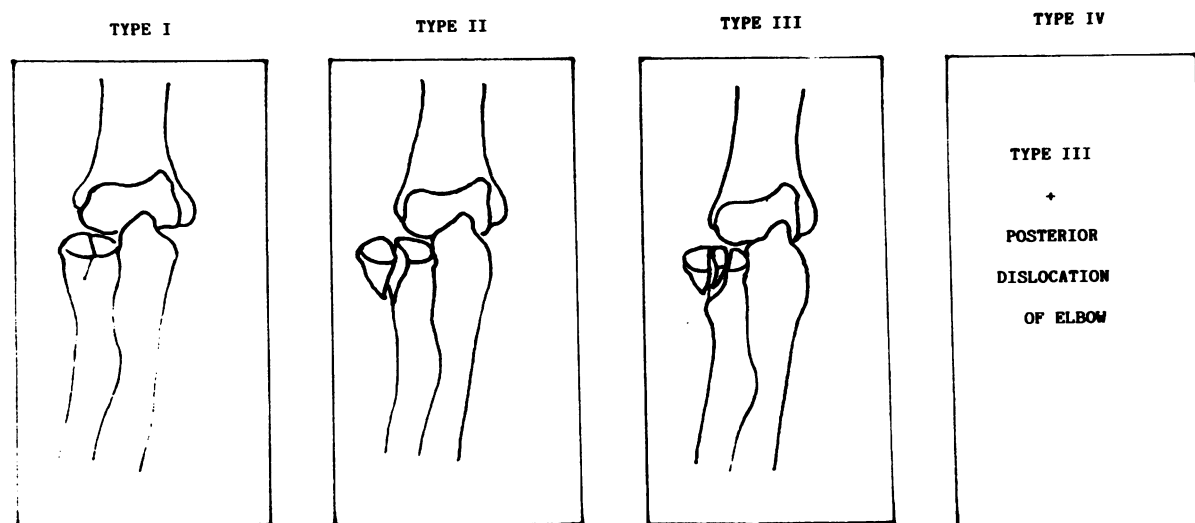


Figure 1 Mason classification of radial head fractures (Modified by Johnston)



Figure 2 X-rays of radial head fractures: (a) antero-posterior; (b) 45° oblique; (c) radio-capitellar view; and (d) lateral

Table 1 Example of functional rating index from Morrey *et al.*

Variable				
Motion	Normal range	Calculated score	Maximum	Points score*
Flexion	150°	Arc of Motion \times 0.2	30	
Extension	10°	Arc of Motion \times 0.2	2	
Pronation	80°	Arc of Motion \times 0.2	16	
Supination	80°	Arc of Motion \times 0.2	16	
Strength				
Normal		12		
Mild loss (80% of opposite side)		8		
Moderate loss (50% of opposite side)		4		
Severe loss (limits everyday tasks, disabling)		0		
Stability				
Normal		12		
Mild loss (no limitation)		6		
Grossly unstable		0		
Pain				
None		12		
Mild (activity normal, no medication)		8		
Moderate (with or after activity)		4		
Severe (at rest, constant medication)		0		

*Results

Excellent: 90–100 points; good 80–90 points; fair 70–80 points; poor <70 points

(a)



(b)



Figure 3 Postoperative antero-posterior and lateral X-rays of radial head fractures before and after surgery

parameters—pain, stability, strength, and motion. The result can then be expressed in terms of excellent, good, fair or poor depending on the number of points scored. The 19 patients were further questioned with regard to their return to normal daily activities including work and sport.

Standard AP and lateral X-rays were taken at the time of review and examined for evidence of avascular necrosis, degenerative changes, myositis, significant incongruity or loss of function (Figure 3). Each patient's preoperative X-rays were also available at review.

Table 2 Functional/X-ray results using the Morrey assessment

No.	Age	Sex	Rating score	Normal activity	X-ray
1	65	F	90–95	Yes	N
2*	53	M	95–100 (85)	Yes	N
3†	47	F	85–90	Reduced	ABN
4–10		F	Excellent	Yes	N
11†	28	F	85–90	Reduced	N
12†	25	F	80–85	Yes	N
13–19		M	Excellent	Yes	N

*Sustained bilateral fractures

†Higher levels of pain; No.3 malunited fracture

N=Normal; ABN=abnormal

RESULTS

There were 12 right radial head fractures and seven left. Seventeen of the 19 patients reported an injury caused by a fall on the outstretched hand with the elbow extended. One stated that she had sustained a direct blow to the elbow and the remaining patient could not recall the mechanism of injury.

There were no operative complications. Seventeen patients reported a return to full occupational and sporting activities. One avoided heavy lifting and another had not yet returned to contact sports due to mild pain.

Using the Morrey assessment, 16 of the 19 patients had excellent functional results (Table 2). Three patients scored 80–90 points and were classified as good due to moderate levels of pain with activity. No patients reported wrist pain. All 19 patients were noted to have some mild loss of elbow extension (10° – 15°). Interestingly, one patient (No. 2) had sustained bilateral grade II fractures of the radial heads. It was decided to treat only one by operation. The reason for this was not recorded. The operated side (left) scored 'excellent' while the non-operated side was 'good' only, due to pain with activity and significant reduction in range of motion.

On reviewing the X-rays all fractures were found to have healed. One patient (No. 3) had a malunited fracture because of inadequate reduction. There was no evidence of avascular necrosis, myositis or degenerative changes in any of the 19 patients' X-rays.

DISCUSSION

Many authors who have written on the subject of radial head injuries did not classify the fractures into different types. It is accepted by most surgeons that grade I fractures with an undisplaced crack of the radial head have a very different outcome to that of very comminuted proximal radial head fractures with associated soft tissue injury. Thus, the assessment of results is unclear and the recommendations

from many papers unreliable. We have reviewed a series of Mason type II fractures to reduce some of the variables. We would agree with most recent authors that type I fractures do well with early mobilization. The type III fracture is a difficult injury due to the often associated injuries and its management will be dealt with in another study.

Our review of the literature revealed a diversity of recommended treatments for radial head fractures:

(a) *Early motion*. Quigley and others^{4,5,18,19} have in the past recommended aspiration and local anaesthetic injection followed by early motion. However, they noted poor results with the more displaced fractures, namely types II and III. Mason felt that only with a perfect reduction was a good result possible in his series of 100 cases¹.

(b) *Excision of the proximal radius without replacement*. Good results have been reported following early excision of the radial head in type II fractures^{4,8,20}. However, other investigators have shown significant long-term complications; in particular, proximal migration of the radius with associated wrist pain^{13,21–23}.

(c) *Excision with replacement either early or delayed*. Again this procedure is not without problems, particularly when silastic implants are used^{2,24–26}. To avoid the problems of silastic synovitis Knight has advised the use of a metal prosthesis³.

(d) *Open reduction with internal fixation of the radial head fragments*. This a logical extension of experience in the management of intra-articular fractures of other joints. Various methods of fixation have been employed^{4,7,27,28} and improved results have been claimed. Anatomical studies^{1,7,28} suggest that most of the articular surface of the radial head articulates with the proximal ulna at the superior radial ulnar joint. It is, therefore, impossible to achieve fixation using conventional screws, plates or wires without compromising this articular surface in the majority of radial head fractures. Using the Herbert screw which can be buried beneath the articular cartilage of the radial head, motion is possible without impingement on the ulna side of the joint. Thus, the surgeon fixing Mason type II fractures can usually achieve rigid fixation and allow early motion.

Khalfayan *et al.*²⁷ obtained better results when type II fractures were treated with open reduction and internal fixation when compared to those treated without operation. Bunker and Newman⁷ used Herbert screws in a series of 10 radial head fractures and claimed good results. McArthur²⁹ also noted excellent results when this type of fixation was employed in type II fractures. However, he found the type III fracture a difficult problem with a less predictable outcome. We specifically excluded type III fractures, especially those with gross comminution. Our results confirm that excellent or good functional results can be achieved with aggressive management and early motion with the type II injury. Although there was often a slight loss of

extension in our series, in contrast to Holdsworth's view¹⁹, we did not find that this interfered with function.

It became clear to us during the course of this investigation that the routine AP and lateral X-rays, which are utilized in most accident departments, were not always adequate with regard to the management of this injury. The 45° oblique view may reveal significant displacement not obvious on the AP X-ray (Figure 2c). The capitellar/radial view may also be useful in difficult cases (Figure 2d).

Radial head fractures are a continuing challenge. In the light of our experience, we would recommend the use of a Herbert screw in the management of grade II fractures as it allows rigid fixation and as a consequence early mobilization. The surgeon can expect a return to good level of function in the majority of patients.

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